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TYPHOIDAL PERFORATION:

WITH A REPORT OF EIGHT CASES SUBJECTED TO OPERATION; TWO RECOVERIES.*

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IN 1884 Leyden first suggested and Mikulicz first practised suture of a perforated typhoid ulcer. In 1885 James C. Wilson brought the subject before the profession of America, and more recently (1898) interest was aroused in this subject by the brochure of Keen. That operation is still too seldom resorted to is evident when we recall that probably over 16,000 cases perish from perforation annually in the United States,[1] and that in 1903 Harte[2] was able to collect from the literature the records of only 339 cases subjected to operation.

The mortality of typhoid fever is probably about 10 per cent., and it is said that one-third of the fatalities are due to perforation of the intestine.

Perforation usually occurs during the third, fourth, or fifth week, but may happen at any stage of the disease. Males are more frequently affected than females, and the catastrophe is more liable to take place in adolescence than in infancy or old age. When the intestinal wall becomes thinned by the process of sloughing the immediate cause of perforation may be the pressure of hardened feces, straining at stool, excessive gaseous distention of the bowel, or sudden change in posture; in a number of cases ascarides have been found in the peritoneal cavity. Perforation is usually acute and followed by marked symptoms; occasionally it is chronic and the symptoms are insidious, the peritoneal cavity being protected for some time by previous adhesions.

In approaching a case for diagnosis the age, sex, previous condition of the bowels, previous presence or absence of hemorrhage, previous severity or mildness of the disease, and the period of the disease may be disregarded entirely. Pain is a reliable and constant symptom, occasionally violent, usually severe, and rarely mild in character. As a rule, the pain is sudden in onset, begins in the right lower quadrant of the abdomen, quickly becomes generalized, and persists, despite the hebetude of the patient. Le Conte suggests that in view of the great sensibility of the parietal peritoneum the character of pain may be influenced by the proximity of the perforation to the abdominal wall. In a few instances the pain is reflected to the rectum and is accompanied by a frequent desire but inability to defecate. Frequency of micturition, with vesical pain, has also been noted.

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Tenderness is most marked in the region of perforation, usually in the right iliac region, to which area it is limited in the beginning. Rectal or vaginal examination reveals tenderness on the right side at the onset, and later on both sides. Tenderness is of more value than pain. Rigidity of the abdominal muscles is the most valuable sign of perforation of the intestine; it is at first localized over the area of perforation, thence becoming general with the spread of infection. In uncomplicated cases of typhoid, pain is a frequent symptom; tenderness is common over the ileum, and slight rigidity may be present, but the association of these three features is an indication for exploration, and with a fair degree of accuracy indicate, by their character and extent, the intensity and area of peritonitis. The hardening of the belly-wall, due to meteorism, to emaciation, to the application of cold water, or to associated pulmonary disease, must not mislead the surgeon, who should be familiar with the feel of the abdomen in all stages of the disease.

Distention of the abdomen is often present throughout the disease, and is not an important sign, although it becomes more pronounced after perforation. The vital point is to determine whether the gas is within the bowel or in the peritoneal cavity outside the bowel. Partial absence of liver dulness may be produced by tympanitic distention of the intestine, but total obliteration of liver dulness not associated with distention of the abdomen is due to gas outside the bowel and indicates perforation of the alimentary canal. It has been suggested that in cases in which gas is free in the peritoneal cavity the chest sounds may be distinctly heard over the abdomen, but this is equally true when the intestine is distended with gas without perforation. Tschunowsky[3] claims to have heard an amphoric murmur, synchronous with respiration, over the point of perforation; he attributed the sound to the exit and entrance of air through the opening in the intestine. "In pneumatosis of the abdominal cavity one sometimes gets a peculiar quality of sound on deep percussion which resembles the cracked-pot sound."[4]

As the result of experiments on animals, Connell[5] believes that perforation may be diagnosticated by tapping the abdomen, injecting air or salt solution, and, after regaining the injected material, testing it for hydrogen sulphide. It seems to us that exploratory incision would be more certain and less dangerous.

It has been advised in cases of suspected intestinal perforation to inject air, hydrogen, or ether into the rectum; if there be no perforation the gas will pass through the intestine and out of the mouth; if an opening into the peritoneal cavity exists the gas will pass through the perforation, increase the distention of the abdomen, and obliterate the liver dulness. This method increases the extravasation of intestinal contents and is not to be employed.

Dulness in the flanks, as indicative of fluid in the peritoneal cavity, is a fallacious sign, as it is sometimes present in the absence of perforation and often absent in cases in which perforation has occurred and in which there is a large quantity of fluid in the peritoneal cavity.

Localized impairment of resonance is of little value as a sign, as it is seldom found, even when there is an attempt at walling off the peritoneal cavity.

Immobility of the abdomen and thoracic respiration accompany rigidity, and are important signs.

Auscultation rarely reveals a friction sound, but may elicit the presence or absence of peristalsis, which is of more value from the standpoint of prognosis than of diagnosis.

Nausea and vomiting occur in less than 25 per cent. of the cases and are often present without perforation. A chill at the onset of perforation is not common. The classical symptoms of shock do not ensue as often as is generally believed. In many cases the temperature remains unchanged, and in some it rises. Sweating is a frequent symptom. The respirations are increased in frequency and thoracic in character; the pulse is accelerated and the blood pressure, as determined by the Riva Rocci sphygmomanometer, is distinctly raised.[6] The facial expression is altered and characteristic in many cases, and is a feature on which much stress is laid. A leukocytosis is only of value when corroborative of other signs.

Typhoidal perforation may be confounded with almost any other lesion producing a peritonitis, but as treatment in these cases would usually demand exploration a failure to differentiate would not be productive of harm. The most difficult differential diagnosis to make is that between intestinal hemorrhage and perforation, as the symptoms are sometimes identical and the differentiation is of the greatest importance, for to mistake hemorrhage for perforation means an unnecessary operation at a very critical period, and to mistake perforation for hemorrhage means death. The appearance of blood in the stools is not conclusive, as the two conditions may coexist. A reduction in the number of red cells and in the hæmoglobin would point toward hemorrhage, whereas an excess in the number of white cells would incline toward perforation. It is of the utmost importance to withhold opium in cases of hemorrhage in which perforation is suspected, because of the danger of clouding the symptoms.

With Osler we may say: "That time-honored picture of perforation with the Hippocratic facies; the feeble, running pulse; the profuse sweat; the distended, motionless abdomen must be erased as not a picture of perforation, but of peritonitis, or, better still, a rough draught of death. What we need more than anything at present is a fuller knowledge of the symptoms of perforation, particularly of its onset, apart from those of the consecutive peritonitis."[7] But, unfortunately, there is nothing in the perforation itself which will enable one to suspect it; the signs and symptoms that are elicited are due to peritoneal infection, the very onset of which we should make an effort to recognize. Obliteration of liver dulness in a flat belly or resonance over the posterior and lateral area of hepatic dulness in a distended abdomen and cellular emphysema are the only pathognomonic signs of an opening into the intestine. The former, however, is a late sign, and the latter does not occur in typhoidal perforations.

The only safe rule is to have every typhoid watched most carefully, to examine thoroughly at the onset of any of the above symptoms, and to open the abdomen if the evidence gathered leave a doubt as to perforation. If there be doubt, exploration may be conducted under local anæsthesia; but if the diagnosis be positive or if exploration reveals perforation, ether should be employed, as the operation may be performed more quickly, the abdominal cavity may be cleansed more thoroughly, and the patient is not subjected to the deleterious effects of fright and struggling. Operation should be done at the earliest possible period. Some authors advise waiting for the subsidence of shock, but if shock is present the danger of delay far outweighs the danger of a rapid operation, in which the ether and the flushing of the abdominal cavity with hot salt solution tend to combat rather than aggravate the symptoms of shock. All cases should be operated upon, no matter how ill they are, as some remarkable recoveries have been reported. The incision is made in the right iliac region, as from 85 per cent. to 90 per cent. of all perforations are found in the last twenty or thirty inches of the ileum or in the cæcum or appendix. If the perforation be not found in the ileum and there are evidences of peritonitis, the sigmoid, the colon, and the remainder of the small intestine should be explored in the order mentioned, making a median incision if necessary. If the ileum be intact and there are no evidences of peritonitis, a mistake in diagnosis has probably been made, but the incision should not be closed without further exploration. Ross[8] reports a case of suspected perforation in which exploration revealed a normal peritoneum and an intact ileum; an intussusception was found in the jejunum. The perforation may be sutured with a double row of continuous Lembert sutures of silk. The continuous suture is more rapid than the interrupted suture and just as safe. It is not necessary to excise the ulcer. A large perforation should be sutured obliquely, so as not to interfere with the fecal current. Search for a second perforation should always be made, for in 17 or 18 per cent. the openings are multiple. All suspicious spots are invaginated with a continuous silk suture. In some cases suture is impossible because of the size of the opening, because of the number of openings in a segment of the bowel, or because a piece of the bowel is gangrenous. Resection would be the ideal treatment in these cases, but as it consumes so much time surgeons have been afraid to try it. Plugging the hole with omentum or fastening the omentum over the perforation may succeed in some instances, but is a hazardous procedure. Isolating the affected portion of bowel by gauze packing has been advocated and may be employed in certain cases. The safest plan is to anchor the intestinal loop outside the abdominal cavity; this not only makes the isolation more complete, but relieves threatening symptoms of distention, and allows the local application of medicaments to the interior of the bowel for the treatment of the remaining typhoid ulcers.

After dealing with the perforation the abdomen should be flushed with gallons of hot salt solution, unless the infection be distinctly limited, in which case the affected coils should be drawn from the abdomen and thoroughly washed extraperitoneally, as a general peritoneal lavage in these cases would disseminate the infection. The abdomen is usually drained by gauze, one strip of which is pushed down into the pelvic cavity. The after-treatment is that of other abdominal cases, excepting that the patient must be carefully watched for symptoms of secondary perforation.

The prognosis is more favorable when the perforation occurs early in the disease, when the diagnosis is made quickly after the onset, and when the surgeon possesses skill and good judgment. According to Harte,[2] the mortality in 277 cases in successive intervals was as follows: 1884 to 1889, 10 cases, 90 per cent.; 1890 to 1893, 16 cases, 87.5 per cent.; 1894 to 1898, 110 cases, 74.5 per cent.; 1899 to 1902, 141 cases, 66.6 per cent.

The following is an abstract of eight cases operated upon.

Case I.—Male, aged ten years; operated upon July 28, 1901, at the Pennsylvania Hospital, twelve hours after perforation, which occurred on the thirteenth day of the disease. Pain during the entire disease, worse at the time of operation, but not severe. Tenderness all over the abdomen, but most marked in the right iliac region. No vomiting. Obliteration of liver dulness, movable dulness in the right flank, rigidity of the right rectus, thoracic breathing, distention, fall of temperature from 103° F. to normal, leukocytes 4000. Incision in the right semilunar line; liquid feces in the abdominal cavity. In the ileum, six inches from the cæcum, was a large indurated area, with a pinhole perforation in the centre. Double row of continuous Lembert sutures. Peritoneum injected. Death in sixty hours. Post-mortem revealed a closed perforation, the lumen of the bowel constricted one-third, and a general peritonitis.

CASE II.—Female, aged twenty-three years; operated upon December 15, 1901, at the Pennsylvania Hospital, forty-eight hours after perforation, which occurred during the fifth week of the disease. This patient walked about until the time of perforation, which was inaugurated with violent pain in the region of the appendix. Admitted to the hospital immediately before operation. Vomiting, Hippocratic facies, swollen belly, obliteration of liver dulness, no dulness in the flanks, belly immobile, moderate tenderness in the right iliac region. Temperature 103° F., pulse scarcely perceptible; anæsthetic 1 per cent. cocaine solution; incision right semilunar line; large quantity of yellow fluid mixed with flakes of lymph; perforation in ileum three inches from the cæcum, one-eighth of an inch in diameter. Patient died one-half hour after operation.

CASE III.—Male, aged nineteen years; operated upon August 25, 1902, at the Polyclinic Hospital during the third week of the disease, fourteen hours after perforation. Sudden severe pain, distention, tenderness and rigidity on the right side, tympanitic over liver, leukocytes 10,000. Previous diarrhœa. No vomiting, no dulness in the flanks, thoracic respiration, temperature unchanged. Perforation in ileum five inches from the cæcum, size of a lead-pencil; liquid feces in the peritoneal cavity; gauze drain through the primary incision and rubber tube through the loin. Vomited once after operation, distention less, pain absent, fever persistent, diarrhœa continued, death third day. Post-mortem revealed closed perforation, dry peritoneal cavity, and a few adhesions. Cause of death typhoid(?).

CASE IV.—Male, aged twenty-three years; operated upon February 4, 1902, at the Jefferson Hospital, during the third week of the disease and twelve hours after perforation. Admitted to hospital just before operation. Pain, tenderness, and rigidity in the right iliac region. Temperature 104° F., pulse 120, respirations thoracic; severe pain, reflected to the rectum and associated with tenesmus; distention, liver dulness obliterated one-half, no dulness in the flanks, no vomiting, leukocytes 7200. Perforation in ileum six inches from the cæcum, size one-quarter of an inch; yellow feces and gas in the peritoneal cavity; gauze drain. Pulse and temperature fell to normal after operation, later rose to 103° F., and remained elevated. There were no further abdominal symptoms, but the patient died on the eighth day, apparently from typhoid. No post-mortem.

CASE V.—Male, aged thirty years; operated upon June 6, 1903, at the Pennsylvania Hospital, immediately after admission. No satisfactory history could be obtained, as the patient was a Pole who understood no English. Dulness and rales over the bases of both lungs; pinched expression. Temperature 100° F., respirations

40, pulse 140, sweating; retracted, rigid belly; absence of liver dulness; costal respiration. Diagnosis perforative peritonitis; median incision; perforation in ileum eighteen inches from the cæcum, one-half inch in diameter; a smaller perforation was found one-half inch above the first perforation. Abdominal cavity filled with feces and pus. Death one hour later.

CASE VI.—Male, aged forty-two years; operated upon June 7, 1903, at the Pennsylvania Hospital, immediately after admission. No history obtainable, as the patient was a Pole who could understand no English. Temperature 100° F., pulse 100, respirations 30. Great pain in the abdomen and right shoulder; tenderness all over the abdomen, and especially marked over the site of a left inguinal hernia; belly immobile and rigid, dulness in the flanks, liver dulness decreased one-half, vomitus nigra. Diagnosis perforative peritonitis; median incision; liquid feces and pus in the abdominal cavity; mesentery glands enlarged; perforation in the ileum one-half inch in diameter, three feet from the cæcum. Closure of perforation with a double row of Lembert sutures, lavage with hot salt solution, gauze drainage. Uneventful recovery. Widal reaction positive.

CASE VII.—Female,* aged nine years; operated upon June 24, 1903, at the Jefferson Hospital, on the thirteenth day of the disease, three hours after perforation. The temperature had been running along at about 104° F., the pulse 120, and the respirations 20. She complained of severe pain in the right iliac region; this lasted for a short time, and the patient complained no more, even when questioned. The temperature, pulse, and respirations remained unchanged. No vomiting, slight tenderness and rigidity in the right iliac region, movable dulness in the right flank, liver dulness one finger's breadth above the costal margin, abdominal respiration. Two bowel movements between the time of perforation and operation. Tenderness on the right side per rectum, leukocytes 18,000. Incision in the right semilunar line; clear fluid in the belly, no feces or pus; peritoneum normal; perforation in ileum the size of the lead in a lead-pencil, ten inches from the cæcum and midway between the mesentery and the free border of the bowel. The perforation was closed by a small, yellowish slough, which became dislodged as the bowel was pulled through the wound. Continuous Lembert suture, flush with salt solution, and closure of the abdomen without drainage. The patient continued with the typhoid symptoms, and made a good recovery.

CASE VIII.—Male, aged forty-one years; operated upon July 8, 1903, at the Jefferson Hospital, two weeks after the beginning of the symptoms of typhoid and nineteen hours after perforation. The patient had been walking about up until nineteen hours before the operation, when he was seized with a sudden severe pain in the lower part of the abdomen. He was admitted to the hospital immediately before the operation. Temperature 101° F., pulse 140, respirations 30. Typical picture of a general peritonitis, liver dulness undiminished, no dulness in the flanks. Diagnosis perforative peritonitis; median incision; fecal matter and pus in the peritoneal cavity; perforation in ileum three-eighths inch in diameter, one foot from the cæcum. Death in thirty hours from peritonitis.

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* This patient developed a small hernia at the site of incision, for which a second operation was performed four months after the suturing of the intestinal perforation. There were no adhesions in the peritoneal cavity, the mesenteric glands were still enlarged, and the site of the perforation was marked by a small grayish patch which was perfectly smooth and slightly indurated. There was no constriction of the intestine.

Analyses of cases operated upon: Sex, 6 males, 2 females. Ages nine, ten, nineteen, twenty-three, twenty-three, thirty, forty-one, and forty-two years. Day of disease on which perforation occurred: 2 on thirteenth day, 1 during second week, 2 during the third week, and 1 during the fifth week; in 2 cases no satisfactory history could be obtained, the patients being unable to understand English. Number of hours elapsing between the time of perforation and operation: three hours in 1 case (recovered), twelve hours in 2 cases, fourteen hours in 1 case, nineteen hours in 1 case, and forty-eight hours in 1 case. In 2 cases, 1 of whom recovered, the time elapsing between perforation and operation could not be determined. Pain during the entire course of the disease in 2, absence of pain previous to perforation in 4, unknown in 2. Location of pain in right iliac region in 5, general in 3. In 1 case the pain was reflected to the right shoulder, and in 1 case the pain extended to the rectum and was associated with tenesmus and a frequent desire but inability to defecate. The pain was violent in 1 case, severe in 6, and moderate in 1; in 1 case in which the pain was severe at the onset it disappeared soon after its appearance and remained absent up until the time of operation. The facial appearance was altered in all except the 2 that recovered. Mental hebetude was present in all. Previous bleeding from the bowel was absent in 6 and unknown in 2. Vomiting was absent in 5 and present in 3. Constipation had been present in 2, diarrhœa in 4, and 2 unknown. A chill was not noted in any of the 6 cases from whom a history could be obtained. In 1 case the temperature fell 3 degrees to normal, in 5 the temperature remained unchanged, and in 2 the temperature at the time of perforation could not be obtained. The pulse and respirations were accelerated in all. Localized impairment of resonance was not noted in any of the cases. Sweating was present in 6 and absent in 2. Distention was absent in 2 only. Immobility of the abdomen and thoracic respiration were present in 7 and absent in 1 case. Friction sound was not heard in any of the cases. Peristalsis was heard in 1 case, in which the bowels moved twice after perforation and in which recovery ensued. The liver dulness was totally absent in 4, partly absent in 2, and present in 2. Dulness in the flanks was present in 2 cases only. Rigidity was present in all. Tenderness was general in 5 cases and limited to the lower right abdomen in 3. Rectal examination revealed tenderness in the 7 cases in which it was made. The leukocytes in 4 cases were 4000, 7200, 10,000, and 18,000. The diagnosis was made in 5 cases, and the incision was made in the right iliac region; in 3 cases a diagnosis of perforative peritonitis was made and the abdomen opened in the middle line. The perforations were situated in the ileum within three feet of the cæcum in all cases, and varied in size from a pinhole up to one-half inch in diameter. In 1 case there were two perforations. Fecal matter was present in the peritoneal cavity in all except 1 case, in which the fluid was clear and in which recovery ensued. The peritoneum was inflamed in all but 1 case, in which recovery ensued. Mesenteric glands were enlarged in all. In only 1 case was it necessary to tear through adhesions to find the perforation. In all cases a double row of continuous Lembert suture of silk was employed. All were drained with gauze, surrounded by a rubber dam, except 1 (recovered); in 1 case (died) in addition to the gauze drainage in the primary incision a rubber tube was brought out through the loin. Ether was used as an anæsthetic in all cases except 1, in which the operation was performed under cocaine. 5 of the cases were admitted to the hospital immediately before operation, and 2 walked about until the time of perforation. 2 recovered, 2 died of typhoid (?), and 4 died of peritonitis.

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PAROTITIS COMPLICATING APPENDICITIS.[1]

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THE first reported instance of parotitis as a postoperative complication of appendectomy is that reported by Barlow, in 1886, who, in a male aged twenty years, reports the occurrence of a parotid bubo, "which did not suppurate." In the operation, collections of fetid pus around the cæcum had been found. The appendix vermiformis was noted to have been much thickened, but apparently it was not re-

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[1] Read before the Academy of Medicine of Toledo, Ohio, October 23, 1903.